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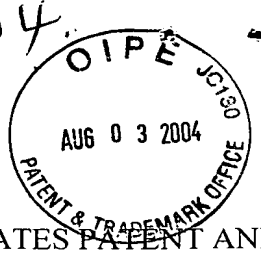

Attorney's Docket No. 5649-842

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re: Kang et al.
Serial No.: 09/665,208
Filed: September 18, 2000
For: APPARATUS FOR FORMING THIN FILM

Confirmation No.: 4274
Group Art Unit: 1763
Examiner: K. Moore

Date: August 3, 2004

Mail Stop Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF APPEAL BRIEF
(PATENT APPLICATION--37 C.F.R. § 1.192)

1. Transmitted herewith, in triplicate, is the APPEAL BRIEF for the above-identified application, pursuant to the Notice of Appeal filed on May 13, 2004.

2. This application is filed on behalf of
☐ a small entity.

3. Pursuant to 37 C.F.R. § 1.17(c), the fee for filing the Appeal Brief is:

☐	small entity	$165.00
☒	other than small entity	$330.00

Appeal Brief fee due $330.00

☒ Any additional fee or refund may be charged to Deposit Account 50-0220.

Respectfully submitted,

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I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to Mail Stop Appeal Brief-Patents, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Betty-Lou Rosser

Attorney's Docket No. 5649-842 **APPELLANT'S BRIEF ON APPEAL**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re: Kang et al. Confirmation No.: 4274
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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPELLANT'S BRIEF ON APPEAL UNDER 37 C.F.R. § 1.192

Sir:

This Appeal Brief is filed pursuant to the "Notice of Appeal to the Board of Patent Appeals and Interferences" filed on May 13, 2004 and is filed in triplicate pursuant to 37 C.F.R. § 1.192. A petition for a one-month extension of time and the necessary fee are enclosed herewith.

REAL PARTY IN INTEREST

The real party in interest is Samsung Electronics Co., Ltd., a Korean corporation having a principal place of business at 416 Maetan-dong, Paldal-gu, Suwon-City, Kyungki-do, Republic of Korea, the Assignee of this application.

RELATED APPEALS AND INTERFERENCES

Appellants are unaware of any related appeals and/or interferences that will directly or indirectly affect this Appeal or have any bearing on the Board's decision in this Appeal.

STATUS OF CLAIMS

Claims 24, 25, 27-35, 45-50, 55, and 58 are pending in this case and stand rejected.

Claims 27-29, 31-35, 55, and 58 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Yamada et al. (U.S. Pat. No. 5,501,739) in view of Tsu et al. (U.S. Pat. No. 6,096,597). *See, Final Action* at p. 2, ¶¶ 2-15.

Claim 24 stands rejected under 35 U.S.C. § 103(a) as being obvious in light of Yamada et al. and Tsu et al. in combination with Moleskin et al. (U.S. Pat. No. 5,217,559). *See, Id.* at p. 4, ¶¶ 16-20.

Claim 25 stands rejected under 35 U.S.C. § 103(a) as being obvious in light of Yamada et al. and Tsu et al. in combination with Montev et al. (U.S. Pat. No. 4,578,880). *See, Id.* at p. 4, ¶¶ 21-25.

Claims 30 and 45-50 stand rejected under 35 U.S.C. § 103(a) as being obvious in light of Yamada et al. and Tsu et al. in combination with Benzing (U.S. Pat. No. 4,786,352). *See, Id.* at p. 5, ¶¶ 26-46.

STATUS OF AMENDMENTS

A Final Office Action ("Final Action") was mailed on December 16, 2003. A response to the Final Action was not submitted. A Notice of Appeal was filed on May 13, 2004 in response to the Final Action.

SUMMARY OF THE INVENTION

The present invention relates to an apparatus for forming films on substrates, and in particular, an apparatus for forming thin films such as electrodes and dielectric layers. The apparatus includes an oxygen radical or plasma annealing unit connected to a multi-functional chamber. *See, Specification* at p. 19, lines 10-12. Oxygen radicals or plasma provided by the oxygen radical or plasma annealing unit may be used to oxygen radical or plasma anneal a lower electrode, dielectric layer, or an upper electrode to a semiconductor wafer. *See, Id.* at lines 14-17. The apparatus may also include a loadlock chamber for loading semiconductor wafers into the apparatus. *See, Id.* at lines 1-2. A transfer chamber for transferring semiconductor wafers

between various portions of the apparatus may also be included with the apparatus. *See, Id.* at lines 3-9.

The multi-functional chamber of the apparatus of the present invention may include a supporting plate for holding semiconductor wafers or substrates. *See, Specification* at p. 20, lines 8-10. A heater, such as a lamp, for controlling the temperature of a semiconductor wafer or substrate on the supporting plate is positioned under the supporting plate. *See, Id.* at lines 12-19. A source dispersion device, such as a shower head type dispersion device, is positioned over the supporting plate for dispersing gas into the multi-functional chamber. *See, Id.* at lines 19-22. A source supplier for providing a source gas to the source dispersion device is in fluid communication with the source dispersion device. *See, Id.* at lines 21-22. The source supplier includes an organic source for supplying an organic source solution to be used in the deposition processes carried out in the multi-functional chamber. *See, Id.* at p. 20, line 23 – p. 21, line 18. The organic source is in fluid communication with a flow controller, which in turn, is in fluid communication with one or more evaporators. *See, Id.* A transfer gas source may be in communication with the evaporators for providing a transfer gas to the evaporator to be mixed with evaporated organic source gas and delivered to the multi-functional chamber. *See, Id.*

An oxygen radical annealing unit connected to the multi-functional chamber comprises an ozone generator for performing an ozone annealing process within the multi-functional chamber. *See, Specification* at p. 21, lines 19-22. Oxygen and nitrogen gases are fed to the ozone generator to create ozone that is then flowed into the multi-functional chamber. *See, Id.* at lines 22-29. The apparatus may also include an ozone remover with a pump installed in an exhaust of the multi-functional device for removing ozone from the multi-functional chamber and controlling the pressure within the multi-functional chamber. *See, Id.* at p. 21, line 29 – p. 22, line 2.

A plasma generator connected to multi-functional chamber in the apparatus of the present invention includes a wave guide, magnet coils and a plasma gas source for generating plasma to be fed to the multi-functional chamber. *See, Specification* at p. 22, lines 14-21. The plasma gas

source may include gas selected from the group consisting of O_2, NH_3, Ar, N_2, and N_2O. *See, Id.*

The apparatus may also include a cleaning gas source for supplying a cleaning gas to the multi-functional chamber for cleaning the walls of the multi-functional chamber. *See, Id.* at p. 22, lines 6-8.

A crystallization annealing chamber may also be used in conjunction with the multi-functional chamber for annealing and crystallizing a dielectric layer deposited in an amorphous state on a semiconductor substrate. *See, Specification* at p. 24, lines 19-23. The crystallization annealing chamber is preferably a rapid thermal annealing furnace. *See, Id.* at lines 23-25.

According to embodiments of the present invention, "it is now possible to manufacture thin films and capacitors on substrates...such that the thin films have lower impurity levels and the capacitors have improved electrical characteristics. " *See, Specification* at p. 13, lines 13-16. Further, "it is possible to reduce the leakage current by oxygen radical or plasma annealing the lower electrode after forming the lower electrode and/or oxygen radical or plasma annealing the dielectric layer after forming the dielectric layer." *See, Id.* at p. 33, lines 7-10.

ISSUES

1. Whether Claims 27-29, 31-35, 55, and 58 are obvious under 35 U.S.C. § 103(a) in view of Yamada et al. (U.S. Pat. No. 5,501,739) combined with Tsu et al. (U.S. Pat. No. 6,096,597).

2. Whether Claim 24 is obvious under 35 U.S.C. § 103(a) in view of the combination of Yamada et al., Tsu et al., and Moleskin et al. (U.S. Pat. No. 5,217,559).

3. Whether Claim 25 is obvious under 35 U.S.C. § 103(a) in view of the combination of Yamada et al., Tsu et al., and Montev et al. (U.S. Pat. No. 4,578,880).

4. Whether Claims 30 and 45-50 are obvious under 35 U.S.C. § 103(a) in view of the combination of Yamada et al., Tsu et al., and Benzing (U.S. Pat. No. 4,786,352).

GROUPING OF CLAIMS

The appealed claims are Claims 24, 25, 27-35, 45-50, 55, and 58. The following is the grouping of the claims for this Appeal:

(a) Claims 24, 27-35, 55, and 58 stand and fall together;

(b) Claim 25 stands and falls alone; and

(c) Claims 45-50 stand and fall together.

ARGUMENT

None of Claims 24, 25, 27-35, 45-50, 55, and 58 are obvious in light of the cited references. The combinations of references cited by the Office fail to establish all of the requirements of a *prima facie* obviousness rejection. For at least the reasons stated herein, and those previously made of record, Claims 24, 25, 27-35, 45-50, 55, and 58 are allowable over the outstanding rejections.

Claims 27-29, 31-35, 55, and 58 stand rejected under 35 U.S.C. § 103(a) as being obvious in light of the primary combination of Yamada et al. and Tsu et al. In addition, Claims 24, 25, 30, and 45-50 are rejected under 35 U.S.C. § 103(a) based upon the combination of Yamada et al. and Tsu et al. with additional references. The recited combinations fail to teach or suggest all of the recitations of the claims. Furthermore, there is no motivation to combine the primary reference of Yamada et al. with Tsu et al. The lack of teaching and motivation precludes a *prima facie* obviousness rejection because all of the necessary criteria for such a rejection are not satisfied. In particular:

> To establish a *prima facie* case of obviousness, three basic criteria must be met. First, **there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings.** Second, there must be a reasonable expectation of success. **Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.** The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure.

See, M.P.E.P. *§2142, citing In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991)(emphasis added). The criteria required to establish a *prima facie* obviousness rejection are not satisfied by the combinations of references cited in the Final Action.

> Specifically, Yamada et al. (U.S. Patent No. 5,501,739) provides:
>
> an apparatus and method for forming a thin film which can prevent the generation of dust on the surface of a film after the film is formed on a substrate and the deterioration of the properties of the film. *Yamada et al.* at col. 2, lines 14-18.

The apparatus of Yamada et al. includes "an atmospheric pressure CVD apparatus" having a "heating chamber 24," a "film forming chamber 26," a "cooling chamber 30," and "an organic molecular layer forming chamber 37." *Yamada et al.* at col. 3, lines 17-53. A substrate with a BPSG layer formed in the film forming chamber is transferred to the organic molecular layer forming chamber wherein "a hydrophobic organic molecular layer is formed to thereby prevent the generation of dust on the surface of the substrate and the deterioration of the film properties." *Id.* at col. 4, lines 38-41. The organic molecular layer preferably includes silicon or germanium. *Id.* at col. 2, lines 27-37 and col. 4, lines 41-43. Yamada et al. is not concerned with improving the performance of a capacitor or dielectric material but rather with the protection of films from dust and deterioration.

Tsu et al. describes a "method for forming an improved dielectric material." *Tsu et al.* at col. 1, lines 66-67. Although the methods recited by Tsu et al. include post dielectric deposition anneals, Tsu et al. never describes an apparatus for carrying out the post dielectric deposition anneals. Furthermore, Tsu et al. merely indicates that its two step anneal is performed after a dielectric layer has been formed. *Tsu et al.* at col. 6, lines 25-36.

(a) Claims 24, 27-35, 55, and 58

Claims 24, 27-35, 55 and 58 stand and fall together. In particular, dependent Claims 24, 26-34, 55, and 58 stand and fall with independent Claim 27. Claims 24, 28, 30-31, 35, 55, and 58 depend directly from Claim 27 while Claims 29 and 32-34 depend indirectly from Claim 27.

Claim 27 recites, in part, an apparatus for forming a thin film on a substrate, which apparatus includes a multi-functional chamber. The multi-functional chamber "comprises: a support plate...; a heater unit...; a source dispersion device...; a source supplier...; and an oxygen radical or plasma annealing unit connected to the multi-functional chamber...." Neither Yamada et al. nor Tsu et al. teach or suggest the recited annealing unit or any annealing unit connected to a multi-functional chamber.

The Final Action acknowledges that "Yamada et al. fail to teach the plasma chamber having an oxygen radical or plasma annealing unit connected to the chamber" as recited in Claim 27. *Final Action* at p. 2, ¶ 4. The lack of such teaching precludes a *prima facie* obviousness rejection based upon Yamada et al. alone. *See, In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991). In view of Yamada et al.'s deficiency, Tsu et al. must teach or suggest an oxygen radical or plasma annealing unit connected to a multi-functional chamber as recited in independent Claim 27 if the combination of Yamada et al. and Tsu et al. is to make obvious Claim 27. Tsu et al. does not teach or suggest such a structure. In the absence of such teaching, the combination of Yamada et al. and Tsu et al. fails to make obvious Claim 27 because all of the claim recitations are not taught or suggested by the combination. *See, In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991).

The basis for the obviousness rejection of Claim 27 relies upon the allegation that "it would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided an oxygen radical or plasma annealing unit in Yamada et al." based upon the teachings of Tsu et al. *Final Action* at p. 2, ¶ 6. Although Tsu et al. proposes a two-step annealing process that may include an O_2 plasma anneal and an ozone anneal, Tsu et al. fails to teach or suggest an apparatus for performing its two-step anneal. *Tsu et al.* at col. 6, lines 25-36. In fact, Tsu et al. never describes an apparatus for performing an oxygen or plasma anneal, leaving one of skill in the art guessing as to how, when, or where the process is to be performed. The disclosure of Tsu et al. certainly does not teach or suggest that an oxygen anneal or plasma anneal be performed using "an oxygen radical or plasma annealing unit connected to [a] multi-

functional chamber" as recited in Claim 27. Without such teaching, the combination of Yamada et al. and Tsu et al. fails to satisfy the *prima facie* obviousness requirement that the combination of references teach or suggest all of the claim limitations. *See, In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991). Thus, Claim 27 is allowable over the combination of Yamada et al. and Tsu et al.

In response to the Applicants' previous arguments, the "Examiner points out that an apparatus for performing this method is inherently present, although not specifically mentioned" by Tsu et al. *Final Action* at p. 7, ¶ 46 (emphasis added). Thus, Tsu et al. does not teach or suggest the type of apparatus used to perform its two-step anneal process. Since neither Tsu et al. nor Yamada et al. teach or suggest an apparatus that could be used to perform the two-step annealing process of Tsu et al. the combination of references fails to satisfy the *prima facie* obviousness rejection criteria. *See, In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991).

The Final Action also argues that the two-step annealing process of Tsu et al. "could not be performed without some sort of apparatus capable of performing the process," therefore, it would be inherent to use an apparatus similar to that recited in Claim 27 to carry out the processes of Tsu et al. *Id.* However, the fact that "some sort of apparatus" is required to perform a two-step process does not inherently disclose an apparatus as recited in Claim 27. The failure of Yamada et al. and Tsu et al. to teach or suggest any type of apparatus that could be used with the Tsu et al. process precludes a *prima facie* obviousness rejection. The only disclosure of an apparatus as recited in Claim 27 is the Applicants' disclosure, which cannot be used in combination with the prior art references to make obvious the Applicants' claims. Absent the Applicants' disclosure, the "inherent apparatus" of Tsu et al. cannot be defined. The absence of a structural definition of the "inherent apparatus" precludes an obviousness rejection of Claim 27 because all of the recitations of Claim 27 are not taught or suggested by the combination of Yamada et al. and Tsu et al.

The failure of Yamada et al. and Tsu et al., either alone or in combination, to teach or suggest an apparatus for forming thin films having a multi-functional chamber that comprises "an oxygen radical or plasma annealing unit connected to the multi-functional chamber" precludes a *prima facie* obviousness rejection of independent Claim 27. *See, In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991). Claim 27 is allowable over the 35 U.S.C. § 103(a) obviousness rejection based upon this discrepancy alone.

Claim 27 is also allowable over the obviousness rejection because there is no motivation in the references or art to combine the process taught by Tsu et al. with the apparatus and process of Yamada et al. to arrive at an apparatus as recited in Claim 27. Yamada et al. propose a process and an apparatus for applying a thin, molecular film of an organic material including silicon or germanium over a dielectric layer in order to protect the dielectric layer from collecting dust and to prevent deterioration of the dielectric layer due to exposure to atmospheric moisture. Yamada et al. does not propose a desire to create any other improvements in its electrical structures.

Tsu et al. proposes a process whereby a two-step anneal is performed on a dielectric layer to improve the capacitor electrical performance and the effective oxide thickness and leakage current density of a capacitor. *Tsu et al.* at col. 6, lines 26-29. However, Tsu et al. does not describe an apparatus for carrying out its process nor does it propose the timing of its two-step annealing process in an integrated circuit fabrication process.

The Final Action indicates that the motivation for combining Yamada et al. with Tsu et al. is "to improve capacitor electrical performance including the effective oxide thickness and leakage current density as taught by Tsu et al." *Final Action* at p. 2, ¶ 6. Yamada et al., however, does not discuss capacitor formation, therefore the recited motivation is absent. Yamada et al. is only concerned with the application of a protective organic molecular layer over a substrate such as a dielectric layer. The formation of the protective organic molecular layer protects the substrate when transferred to a storage cassette. *Yamada et al.* at col. 4, lines 16-20. Although the substrates formed using the Yamada et al. process may be subject to the process of

Tsu et al. later in an integrated circuit fabrication process, there is no motivation to modify the Yamada et al. apparatus to include an oxygen radical or plasma annealing unit to oxygen radical or plasma anneal one or more electrode and/of dielectric layers on a substrate as recited in Claim 27.

Furthermore, Tsu et al. does not motivate a modification of the Yamada et al. apparatus to create an apparatus as recited in Claim 27. Tsu et al. fails to specifically mention the type of apparatus that can be used to perform its process. The Final Action acknowledges this fact. *Final Action* at p. 7, ¶ 46. Even if Tsu et al. motivates the use of its process on the substrates of Yamada et al., an apparatus for performing the process is not disclosed. Without a description of an apparatus such as that recited in Claim 27, there is no motivation to create such an apparatus.

A motivation to create an apparatus that makes obvious the apparatus recited in Claim 27 requires at least one of the references to describe such an apparatus or a portion of the apparatus which can be combined with another disclosure to make obvious a claim. Although the application of a two-step annealing process of Tsu et al. on the substrates of Yamada et al. may be motivated to improve the electrical characteristics of an integrated circuit, there is no motivation to create an apparatus as recited in Claim 27. The Applicants' disclosure is the only source which describes the apparatus as recited in Claim 27. However, the Applicants' disclosure cannot be used as a motivating factor in the combination of obviousness references. Therefore, absent the Applicants' disclosure, there is no motivation to create an apparatus as recited in Claim 27.

The lack of motivation to combine the references to form an apparatus as recited in Claim 27 precludes a *prima facie* obviousness rejection of Claim 27. *See, In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991).

A *prima facie* obviousness rejection of Claim 27 is not supported by the cited references because Yamada et al. and Tsu et al. fail to teach or suggest all of the recitations of Claim 27 and there is no motivation to combine the references to arrive at an apparatus as recited in Claim 27. *See, In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991). Claim 27 is allowable and

withdrawal of the obviousness rejection under 35 U.S.C. § 103(a) in light of the combination of Yamada et al. and Tsu et al. is respectfully requested.

Claims 24, 26-35, 55, and 58 each depend from Claim 27, either directly or indirectly. Dependent claims of a nonobvious independent claim are also nonobvious. *See, In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988)(stating that if an independent claim is nonobvious under 35 U.S.C. § 103 then any claim depending therefrom is nonobvious); *see also,* M.P.E.P. § 2143.03. Therefore, Claims 24, 26-35, 55, and 58 are nonobvious and stand and fall with Claim 27.

(b) Claim 25

Claim 25 stands and falls alone. Claim 25 is rejected under 35 U.S.C. § 103(a) as being obvious in light of the combination of Yamada et al. with Tsu et al. and Montev et al. *Final Action* at p. 4, ¶¶ 21-25.

Claim 25 is dependent upon Claim 27. As with Claim 27, neither Yamada et al. nor Tsu et al. teach or suggest all of the recitations of Claim 25. Furthermore, Montev et al. fails to make up for the deficiencies of the combination of Yamada et al. with Tsu et al.

The combination of Yamada et al. and Tsu et al. fails to establish a *prima facie* obviousness rejection of Claim 27 from which Claim 25 depends. Therefore, the combination of Yamada et al. and Tsu et al. also fail to make obvious Claim 25. In addition, Claim 25 further recites "wherein the multi-functional chamber further comprises an ozone remover connected to an exhaust end of the multi-functional chamber," which is not taught or suggested by the combination of Yamada et al. with Tsu et al. or Montev et al. The lack of such teaching or suggestion precludes a *prima facie* obviousness rejection. *See, In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991).

Montev et al. does not disclose "an oxygen radical or plasma annealing unit" as recited in Claim 27 from which Claim 25 depends. In addition, Montev et al. does not teach or suggest a multi-functional chamber as recited in Claim 27, further comprising an ozone remover connected

to an exhaust end of the multi-functional chamber as recited in Claim 25. Instead, Montev et al. proposes a method and apparatus for curing ink on the exterior surfaces of articles such as pails and buckets. *Montev et al.* at col. 2, lines 49-54. The apparatus of Montev et al. includes an exhaust means for removing ozone from the interior of its apparatus. *Montev et al.* at col. 8, lines 22-30. Although Montev et al. may propose an exhaust means for removing ozone from a paint curing apparatus, Montev et al. does not teach or suggest an ozone remover for a multi-functional chamber used in the fabrication of integrated circuit devices. The failure of Montev et al. and the combination of Yamada et al. with Tsu et al. to teach or suggest all of the recitations of Claim 25 precludes a *prima facie* obviousness rejection. *See, In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991).

The combination of Yamada et al., Tsu et al., and Montev et al. fails to make obvious Claim 25 because none of the references teach or suggest a multi-functional chamber comprising an oxygen radical or plasma annealing unit as recited in the claim from which Claim 25 depends. Montev et al. adds nothing the combination of Yamada et al. and Tsu et al. Furthermore, it would not be obvious for one of skill in the art to modify Montev et al.'s ozone exhaust means for a paint cure apparatus for use with an integrated circuit fabrication process. There is no motivation in the combination of Yamada et al. with Tsu et al. to use such a process and there is no motivation in Montev et al. to use its process in another field, namely integrated circuit fabrication. The lack of motivation precludes a *prima facie* obviousness rejection.

Claim 25 is allowable over the combination of Montev et al. with Yamada et al. and Tsu et al. because all of the recitations of Claim 25 and the independent claim from which it depends are not taught or suggested by the references and because there is no motivation to combine the processes of Montev et al. with an integrated circuit fabrication process. The lack of teaching and motivation precludes a *prima facie* obviousness rejection under 35 U.S.C. § 103(a). *See, In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991).

(c) Claims 45-50

Claims 45-50 stand and fall together. More particularly, Claims 46-49 depend from Claim 45, either directly or indirectly, and stand and fall with independent Claim 45.

Claim 45 recites, in part, an apparatus for forming a thin film on a substrate which includes "an oxygen radical or plasma annealing unit connected to the multi-functional chamber...comprising a gas source selected from the group consisting of O_2, NH_3, Ar, N_2, and N_2O; and a cleaning gas supplier in fluid communication with the multi-functional chamber." The combination of Yamada et al., Tsu et al., and Benzing fails to make obvious Claim 45.

The combination of Yamada et al. and Tsu et al. fail to make obvious an apparatus including "an oxygen radical or plasma annealing unit connected to the multi-functional chamber" as recited in Claim 27. *See, Section (a), supra.* Similarly, Yamada et al. and Tsu et al. fail to make obvious the same recitations in Claim 45. Thus, Claim 45 is not obvious in light of the combination of Yamada et al. and Tsu et al. because the combination fails to teach or suggest all of the recitations of Claim 45 and is lacking motivation for the combination. The combination of Benzing with Yamada et al. and Tsu et al. fails to alleviate the *prima facie* obviousness deficiencies of Yamada et al. and Tsu et al. with respect to the recitation of "an oxygen radical or plasma annealing unit connected to the multi-functional chamber." Benzing does not teach or suggest an oxygen radical or plasma annealing unit connected to a multi-functional chamber as recited in Claim 45. Therefore, Benzing, when combined with Yamada et al. and Tsu et al., fails to make obvious Claim 45. Claim 45 is therefore allowable over the combination because all of the recitations of Claim 45 are not taught or suggested by the cited references. *See, In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991).

Claim 45 also recites "a cleaning gas supplier in fluid communication with the multi-functional chamber." The Final Action indicates that the combination of Yamada et al. and Tsu et al. "fails to teach a cleaning gas supplier in fluid communication with the multi-functional chamber." *Final Action*, at p. 7, ¶ 44. Benzing is cited for allegedly teaching "the use of a

cleaning gas supply...for the purpose of cleaning any tooling (i.e. walls of the chamber) or surfaces of substrates." *Id.*, at p. 7, ¶ 45. However, Benzing does not teach or suggest a cleaning gas supplier in fluid communication with a multi-functional chamber. The combination of a cleaning apparatus of Benzing with Yamada et al. and Tsu et al. does not result in the apparatus as recited in Claim 45 because none of the references make obvious the recited multi-functional chamber having an oxygen radical or plasma annealing unit connected thereto. Claim 45 is not obvious.

Claims 46-50 depend, either directly or indirectly, from Claim 45. Dependent claims of a nonobvious independent claim are also nonobvious. *See, In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988); s*ee also,* M.P.E.P. § 2143.03. Claims 46-50 stand and fall with Claim 45 as dependent claims of a nonobvious independent claim.

CONCLUSION

On the entire record and in view of all the cited references, Appellants submit that Claims 24, 25, 27-35, 45-50, 55, and 58 are not obvious. Accordingly, it is respectfully requested that the Examiner's conclusions be reversed, and that this case be passed to issuance.

Respectfully submitted,

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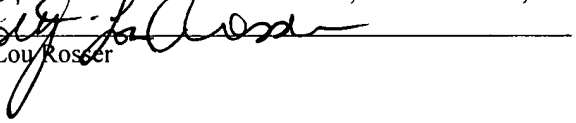

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CLAIMS APPENDIX

1-23. (Cancelled)

24. (Previously Presented) The apparatus of claim 27, wherein the oxygen radical or plasma annealing unit is an ozone generator or a plasma generator.

25. (Previously Presented) The apparatus of claim 27, wherein the multi-functional chamber further comprises an ozone remover connected to an exhaust end of the multi-functional chamber.

26. (Cancelled)

27. (Previously Presented) An apparatus for forming a thin film on a substrate, the apparatus comprising:

a multi-functional chamber configured to deposit a dielectric layer on the substrate, wherein the multi-functional chamber comprises:

a support plate configured to hold the substrate;

a heater unit positioned under the support plate;

a source dispersion device positioned above the support plate and configured to uniformly disperse organic source liquid;

a source supplier in fluid communication with the source dispersion device; and

an oxygen radical or plasma annealing unit connected to the multi-functional chamber and configured to provide oxygen radical or plasma gas to the multi-functional chamber to oxygen radical or plasma anneal one or more electrode and/or dielectric layers on the substrate in the multi-functional chamber, said oxygen radical or plasma annealing unit comprising a gas source selected from the group consisting of O_2, NH_3, Ar, N_2, and N_2O.

28. (Original) The apparatus of claim 27, wherein the source supplier comprises:

a liquid mass flow controller configured to control a flow of organic source liquid;

an evaporator in fluid communication with the flow controller and configured to evaporate the source liquid; and

a transfer gas source in fluid communication with the evaporator and configured to transfer an organic source from the evaporator to the source dispersion device.

29. (Original) The apparatus of claim 28, wherein the source supplier comprises between 1 and 3 evaporators.

30. (Previously Presented) The apparatus of claim 27, further comprising:
a cleaning gas supplier in fluid communication with the multi-functional chamber and configured to supply cleaning gas to remove dielectric material from a wall of the multi-functional chamber.

31. (Previously Presented) The apparatus of claim 27, further comprising:
a loadlock chamber configured to introduce the substrate into the apparatus; and
a transfer chamber connected to the loadlock chamber and configured to transfer the substrate from a first chamber to a second chamber, wherein the multi-functional chamber is connected to the transfer chamber.

32. (Original) The apparatus according to Claim 31, further comprising an electrode deposition chamber connected to the transfer chamber.

33. (Original) The apparatus according to Claim 31, further comprising a crystallization annealing chamber connected to the transfer chamber.

34. (Original) The apparatus according to Claim 31, further comprising an oxygen

radical or plasma annealing chamber configured to pre-treat a lower electrode and connected to the transfer chamber.

35. (Original) The apparatus according to Claim 31, further comprising:

a cooling chamber connected to the transfer chamber; and

a pre-heating chamber connected to the transfer chamber.

36-44. (Cancelled)

45. (Previously Presented) An apparatus for forming a thin film on a substrate, the apparatus comprising:

a multi-functional chamber configured to deposit a dielectric layer on the substrate and configured to oxygen radical or plasma anneal one or more electrode and/or dielectric layers on the substrate, said multi-functional chamber comprising:

a support plate configured to hold the substrate;

a heater unit positioned under the support plate;

a source dispersion device positioned above the support plate and configured to uniformly disperse organic source liquid; and

a source supplier in fluid communication with the source dispersion device, said source supplier comprising:

an organic liquid source;

a liquid mass flow controller configured to control a flow of organic source liquid;

an evaporator in fluid communication with the flow controller and configured to evaporate the source liquid; and

a transfer gas source in fluid communication with the evaporator and configured to transfer an organic source from the evaporator to the source dispersion device;

an oxygen radical or plasma annealing unit connected to the multi-functional chamber

and configured to provide oxygen radical or plasma gas to the multi-functional chamber to oxygen radical or plasma anneal one or more electrode and/or dielectric layers on the substrate in the multi-functional chamber, said oxygen radical or plasma annealing unit comprising a gas source selected from the group consisting of O_2, NH_3, Ar, N_2, and N_2O; and

a cleaning gas supplier in fluid communication with the multi-functional chamber and configured to supply cleaning gas to remove dielectric material from a wall of the multi-functional chamber.

46. (Previously Presented) The apparatus according to claim 45, further comprising:

a loadlock chamber configured to introduce the substrate into the apparatus; and

a transfer chamber connected to the loadlock chamber and configured to transfer the substrate from a first chamber to a second chamber, wherein the multi-functional chamber is connected to the transfer chamber.

47. (Previously Presented) The apparatus according to claim 46, further comprising an electrode deposition chamber connected to the transfer chamber.

48. (Previously Presented) The apparatus according to claim 46, further comprising a crystallization annealing chamber connected to the transfer chamber.

49. (Previously Presented) The apparatus according to claim 46, further comprising an oxygen radical or plasma annealing chamber configured to pre-treat a lower electrode and connected to the transfer chamber.

50. (Previously Presented) The apparatus according to claim 46, further comprising:

a cooling chamber connected to the transfer chamber; and

a pre-heating chamber connected to the transfer chamber.

51-54. (Cancelled)

55. (Previously Presented) The apparatus of claim 27, wherein the oxygen radical is ozone.

56-57. (Cancelled)

58. (Previously Presented) The apparatus of claim 27, wherein the dielectric layer deposited in the multi-function apparatus consists of a material selected from a group consisting of Ta_2O_5, Al_2O_3, TiO_2, Y_2O_3, $SrTiO_3$, $BaTiO_3$, $SrTiO_3$, $PbZrTiO_3$, $SrBi_2Ta_2O_9$, PbZrO 3, $LaZrO_3$, $PbTiO_3$, $LaTiO_3$, and $Bi_4Ti_3O_{12}$.

59-66. (Cancelled)